



MeteoWind Document

MeteoWind Data Interpretation

MeteoWind Devices Metadata

Version 1.0

09/07/2024

Copyright

© Barter4Things 2023. All rights reserved.

Disclaimer

No part of this document may be reproduced in any form without the written permission of the copyright owner.

The contents of this document are subject to revision without notice due to continued progress in methodology, design, and manufacturing. Barter4Things shall have no liability for any error or damage of any kind resulting from the use of this document.

Revision History

Rev	Date	Comment	Author
PA1-v1	09/07/2024	Initial draft	Samaneh Ramezani

Contents

1	Introduction:	7
1.1	Scope:	7
2	MeteoWind Fields:.....	7
2.1	WindAve10:.....	8
2.2	Wind3sGust.....	8
2.3	Wind3sMin	8
2.4	WindStdev.....	8
2.5	DirAve10	9
2.6	Dir3sGust	9
2.7	DirStdev	9
2.8	3sGustTime.....	9
2.9	Vector/Scalar.....	9
2.10	Alarm sent.....	10
2.11	Sample data	10
3	Wind related KPIs:.....	10
4	Wind gust definition:.....	11

Index of Tables:

Table 1 - MeteoWind sensors' fields	8
Table 3 - Beaufort scale	12

Index of Figures:

Figure 1 - MeteoWind sample data	10
---	-----------

1 Introduction:

1.1 Scope:

This document provides a comprehensive explanation of the MeteoWind sensor data and introduces some key performance indicators (KPIs) associated with these measurements. The MeteoWind sensors are designed to measure various wind-related values, including direction, speed, and gusts. Each of these parameters will be explained in detail to offer a clear understanding of their significance and application.

Currently, there is only one Barani MeteoWind Type 2 sensor installed at the Portsmouth International Port, identified by the device ID C338D8.

2 MeteoWind Fields¹:

Field	WindAve10	Wind3sGust	Wind3sMin	WindStddev	DirAve10	Dir3sGust	DirStddev	3sGustTime	Vector/Scalar	AlarmSent
unit	m/s	m/s	m/s	m/s	degree	degree	degree	seconds	binary	binary
Resolution	0.1	0.1	0.1	0.1	1	1	1	5	1	1
Minimum value	0	0	0	0	0	0	0	0	0	0

¹ [MeteoWind messages](#)

Table 1 - MeteoWind sensors' fields

2.1 WindAve10:

The WindAve10 value represents the average wind speed over a 10-minute interval.

2.2 Wind3sGust

The Wind3sGust value represents the gust value according to WMO standards, which is the maximum rolling 3-second average wind speed.

This means the wind speed is averaged over 3-second intervals, and the highest of these 3-second averages during a given time frame (10 minutes) is recorded as the gust value.

2.3 Wind3sMin

The field represents the minimum rolling 3-second average wind speed.

This means the wind speed is averaged over 3-second intervals, and the lowest of these 3-second averages during a given time frame is recorded as the minimum wind speed.

2.4 WindStdev

The WindStdev value represents the standard deviation of the wind speed. This indicates the amount of variation or dispersion in the wind speed measurements over a given time frame.

2.5 DirAve10

The DirAve10 value represents the mean (average) wind direction over a 10-minute interval.

2.6 Dir3sGust

The Dir_3sgust value represents the wind direction at the time of the maximum gust wind speed (Wind3sGust).

2.7 DirStdev

The DirStdev value represents the standard deviation of the wind direction, indicating the amount of variation or dispersion in the wind direction measurements over a given time frame.

2.8 3sGustTime

The 3sGustTime value represents the elapsed time in seconds since the start of the logging interval, with a time resolution of 5 seconds. It indicates the duration that has passed since the beginning of data collection and analysis within the defined logging interval..

2.9 Vector/Scalar

The Vector/Scalar value determines how wind speed and direction are represented:

- Scalar (Scalar = 0): Wind speed and direction are treated as separate, independent values.
- Vector (Vector = 1): Wind speed and direction are combined into a single vector, providing a more comprehensive representation of wind behaviour.

2.10 Alarm sent

The “Alarm sent” value indicates whether an alarm was activated during the current time interval. A value of 0 (default) means no alarm was activated during the last logging interval, whereas a value of 1 indicates that at least one alarm was activated during the last logging interval.

2.11 Sample data

DeviceID	Timestamp	rawData	msgType	Index	BATTERY	WindAve10	Wind3sGust	Wind3sMin	WindStdev	DirAve10	Dir3sGust	DirStdev	3sGustTime	VectorScalar	AlarmSent
C338D8	2024-06-01T00:00:18	0xb4c140c03046b8013260	1	180	4.2	2	4.4	0.8	1.7	348	1	25	24	0	FALSE
C338D8	2024-06-01T00:10:25	0xb5c150a05442cb622bdc	1	181	4.2	2.1	4.1	0	1.6	357	354	21	119	0	FALSE
C338D8	2024-06-01T00:20:08	0xb6c1e0903c4005671e18	1	182	4.2	3	4.8	1.5	1.6	2	359	15	6	0	FALSE
C338D8	2024-06-01T00:30:12	0xb7c1a0983042ca0d2620	1	183	4.2	2.6	4.5	1.4	1.6	357	13	19	8	0	FALSE
C338D8	2024-06-01T00:40:37	0xb8c1a0a0383eba0a2254	1	184	4.2	2.6	4.6	1.2	1.5	349	10	17	21	0	FALSE
C338D8	2024-06-01T00:50:29	0xb9c1a0b02c3aa1561d44	1	185	4.2	2.6	4.8	1.5	1.4	336	342	14	81	0	FALSE

Figure 1 - MeteoWind sample data

The “rawData” field, which consists of hexadecimal digits, is the source from which other values are extracted.

3 Wind related KPIs:

Apart from particular contaminants, meteorological indicators are also included as critical KPIs in air quality dashboards. These consist of wind direction, speed, temperature, and humidity. Since climatic conditions affect how pollutants disperse and change, understanding them is essential for interpreting data on air quality. For instance, the direction and speed of the wind influence how pollutants spread through the atmosphere, while temperature and humidity have an impact on the chemical processes that result in the creation of certain pollutants.²

From the data sent by the MeteoWind sensor Type 2, the following KPIs can be extracted:

- **Average Wind Speed (hourly, daily):** This is a standard metric for understanding general wind conditions and trends, which is essential for air quality analysis.

² [inetSoft website](#)



- **Average Wind Direction:** Knowing the prevailing wind direction helps in understanding how pollutants are likely to disperse.
- **Dominant Wind Direction:** This is useful for identifying the most common wind direction, which can influence long-term air quality patterns.
- **Wind Speed Standard Deviation:** This metric is important for assessing the variability of wind speeds, indicating periods of stable versus highly variable winds.
- **Direction Standard Deviation:** Variability in wind direction can significantly affect pollutant dispersion, making this a relevant KPI.
- **Maximum 3-second Gust and its Direction:** Short-term gusts can have a significant impact on air quality, dispersing pollutants quickly or bringing in new pollutants from other areas.
- **Minimum 3-second Wind Speed:** Understanding periods of calm can help identify times when pollutants may accumulate locally, affecting air quality.
- **Frequency of Wind Gusts:** Frequent strong gusts can influence the overall dispersion and mixing of air pollutants.
- **Direction of 3-second Gust:** Knowing the direction of the strongest winds helps understand the potential source and impact of pollutants.

4 Wind gust definition:

When discussing wind gusts, the criteria become more specific. A wind gust is typically defined as a brief increase in wind speed, where the peak wind speed exceeds 18 mph (8.04672 m/s) and is at least 10 mph (4.4704 m/s) higher than the sustained (average) wind speed³.

The Beaufort scale, which is used in Met Office marine forecasts, is an empirical measure for describing wind intensity based on observed sea conditions⁴.

³ [reference](#)

⁴ [Met office](#)

Beaufort wind scale	Mean Wind Speed	Limits of wind speed	Wind descriptive terms
	ms-1	ms-1	
0	0	<1	Calm
1	1	1-2	Light air
2	3	2-3	Light breeze
3	5	4-5	Gentle breeze
4	7	6-8	Moderate breeze
5	10	9-11	Fresh breeze
6	12	11-14	Strong breeze
7	15	14-17	Near gale
8	19	17-21	Gale
9	23	21-24	Strong gale ³
10	27	25-28	Storm
11	31	29-32	Violent storm
12		33+	Hurricane

Table 2 - Beaufort scale